THE MICROSCOPICAL BULLETIN AND SCIENCE NEWS

A BI-MONTHLY MAGAZINE

JUNE, 1897

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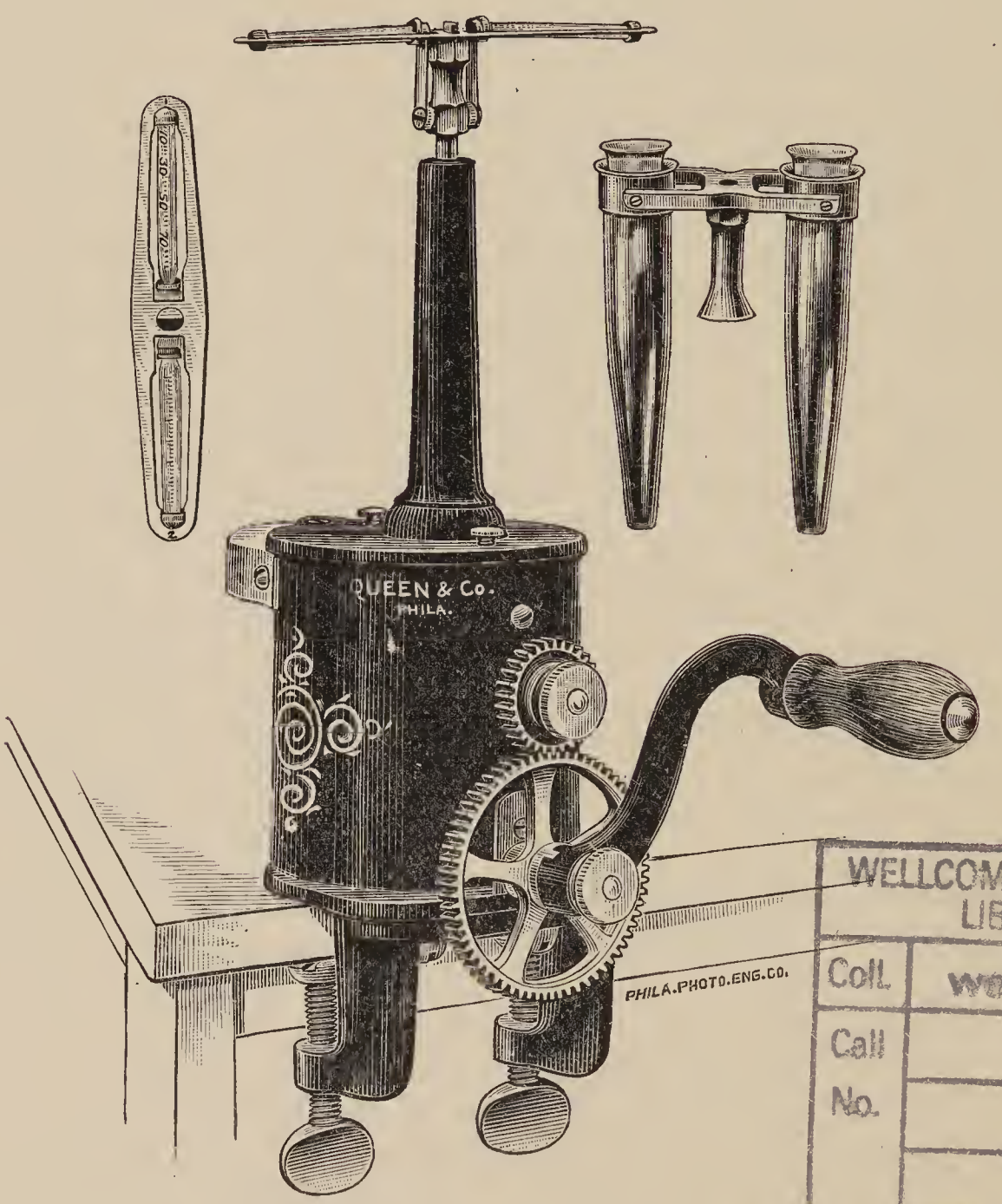

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NOTES AND COMMENTS.

An expedition organized in the Biological Department of the University of New York left for Bermuda on June 3, 1897. The enterprise is under the direction of Professor C. L. Bristol, and is accompanied by Dr. T. H. Bean, of N. Y.; Mr. Walter Rankin, of Princeton University; Mr. W. H. Everett, and a number of students of New York University. While in Bermuda they will organize and erect a permanent biological station there.

* * *

The semi-centennial meeting of the American Medical Association was held in Philadelphia June 2d, 3d and 4th. Over 2000 physicians registered at the main office in Horticultural Hall. The retiring president, Dr. Nicolas Senn, of Chicago, delivered an address reviewing the past work of the organization and predicting a useful continuance of the same. Dr. Austin Flint, of New York, delivered the address on Medicine, and Dr. W. W. Keen, of Philadelphia, the one on Surgery. A considerable addition to the fund toward the erecting of a statue of Dr. Benjamin Rush, in Washington, was raised during the meeting. Surgeon General George M. Sternberg, of the U. S. Army, was elected president to preside over the meeting next year, which will be held at Denver, Col.

The recent death of Alvan G. Clark, of Cambridge, Mass., deprived the scientific world of the last of the great and widely known family of telescope makers. The forty-inch lens of the great Yerkes refractor was the last work of this talented man, and it will serve as a lasting memorial to his skill. In a recent editorial the Philadelphia *Ledger* appropriately says: "Never had men more fitting monuments. The great telescopes of Princeton, Washington, Charlottesville, Pulkova, Mt. Hamilton and Williams Bay, ranging in diameter from 23 to 40 inches, not to mention many other noble instruments of smaller capacity, will perpetuate the name of the Clarks in the world of science."

APERTURE AND ITS EFFECTIVENESS.

BY HENRY ORFORD, PHILADELHPIA.

(*Fourth Paper.*)

It has long been known and taught that resolution increased proportionately with aperture; though so far from microscopic images occupying any peculiar position in this respect, not only have the reasons of the relation, and the theoretical law or limit of resolution been both explained, but both have been applied by the great masters in physical optics to all optical instruments whatever. Nature does not by any means make peculiar and special laws for microscopic images, as many articles published on this subject really imply. All the elements of the following simple exposition are taken from various articles by Lord Rayleigh in the *Philosopical Magazine* and Encyclopædia Britannica; but the essential points have been long understood. The smaller size and greater sharpness of star discs with increased

aperture in telescopes was observed by W. Herschel; Fraunhofer formulated the actual law of inverse proportionality (between disc and aperture) in 1823; Dawes, Airy, Foucault and others have also treated the question. Lord Rayleigh has added popular illustrations of his own, but he has worked on the lines laid down long ago by earlier writers, upon the wave theory. The real fact indeed, is as Lord Rayleigh points out, that we have not got to account for resolution of close detail failing us. The wonder rather is, that even assuming perfect material and workmanship in our lenses we can get images as good as they are, under the actual conditions of the wave mechanism. It is true that in most ordinary optical problems, the elements of this mechanism are so relatively minute that we are apt practically to regard them as infinitely so, and we draw diagrams showing focal points without any sensible error. Many never get beyond such common "geometrical" optics. But in fundamental questions it is necessary to discard this unwarrantable tacit assumption as to the infinitesimal dimension of the wave-length of light, for its actual dimension, and as the physicist above quoted acutely remarks, "it is probably for this reason that the subject of the present section is so little understood outside the circles of practical astronomers and mathematical physicists. Thus microscopists, being mostly men who used their instruments in practical work, and opticians for whose work it has been sufficient to construct lenses geometrically calculated, have known little of what has nevertheless been perfectly well known to the great writers on the undulatory theory. The fact of relation between aperture and resolution can be readily demonstrated by any reader, in a manner Lord Rayleigh has made familar at the Royal Institution, where each hearer of a certain lecture was handed on entrance the primitive apparatus required, it does not require a microscope, or telescope or any lens at all. Take a piece of wire gauze anywhere from 50 to 100 meshes per inch and a bit of black card with two pinholes in it, one very small the other made with a thick pin. Hold the gauze against the sky or evenly illuminated ground of a lamp shade and look at it through the small pinholes gradually removing it farther off. At a certain distance all the meshes will become invisible. Now shift the card (held of course close to the eye) so as to look through the large pinhole; the meshes are again distinctly seen. The greater aperture allowed to the eye has brought them again into view. The experiment may be carried yet further, by going on moving the gauze to a greater distance till the meshes are again lost sight of, and then resorting to a third still larger hole.

It might be thought that merely more light through the large hole has done this. That question may be disposed of by substituting for the pinholes two scratches $\frac{1}{16}$ inch long on blackened glass; one scratch vertical and the other horizotal. Holding the gauze so that the wires also stand vertically and horizontally, it will be found that at the proper distance the vertical scratch will not show the vertical wires, but clearly shows the horizontal ones; with the other scratch it is the opposite. The light passing the scratch is the same in each case; it is the simple aperture-diameter which crosses the wires that determines of what distance those wires can be distinguished or resolved.

We also learn from this simple experiment that distance or focus is a factor in the same problem. So far, then, from this phenomenon having anything special to do with microscope detail finer than $\frac{1}{2500}$ of an inch, or with the microscope, as we have for years been taught physicists have demonstrated it and explained it (without the very least reference to "diffraction with such a coarse object as this and to the naked eye." And it is the same with double stars, which are millions and millions of miles apart. The larger the telescope aperture the closer and the more in number are the doubles which can be resolved, so that Mr. Burnham's immense addition to the list made with the great 36-inch Lick refractor are many of them still unresolvable by telescopes of less resolving power.*

A rule for the resolving power of any objective is that they show a fineness of structure equal to 70,000 multiplied with their N. A. Thus:

N. A.	Fineness of line resolved.
0.1	7.000
0.2	14.000
0.3	21.000
0.4	28.000
0.5	35.000
0.6	42.000
0.7	49.000
0.8	56.000
0.9	63.000
1.	70.000
1.1	77.000
1.2	84.000
1.3	91.000
1.4	98.000
1.5	105.000

THE PHOSPHORESCENCE OF THE OCEAN.

BY PROF. ARTHUR M. EDWARDS, M. D.,
NEWARK, N. J.

In certain portions of the ocean, a light seems to play at night wherever the water is in motion; stir up the waves with an oar, and instantly they seem to be on fire. This fire is a lambent flame that starts into life and then is darkened. This phosphorescence, as it is called, is more or less present in all climates, but more particularly in the tropics, where

*Lewis Wright, Microscopical Images.

the sea seems to be on fire when a boat passes. This light is not peculiar to the sea-water it self, but is resident in the organisms which float therein, and are stirred up by the turning of the oar or passing ship. It seems to be a quality inherent in membranes of the animals crustaceæ—worms, mollusca and the lower order of life, vegetable and protista—in motion. So we cannot know what it is, made light by the oxidation of phosphorus by something in the nervous tissue of the organism. But I wish to set down, what I think has not as yet been recorded regarding the phosphorescence of diatoms, bacillaria which are not seen in the temperate zone, but which are common in the tropics. This is referred to by Dr. John Murray in the Preliminary Report on Specimens of the Sea-Bottom obtained in the Soundings, Dredgings and Trawlings of H. M. S. "Challenger," in the years 1873–75, between England and Valparaiso, in the Proceedings of the Royal Society, Vol. XV; read February 14, 1876—page 471. He says, on page 533: "In the Southern Ocean, south of Kerguelen, in the Arapora Sea, off the coast of Japan, New Guinea, North America, and enclosed bays and invendettas—in short, wherever the specific gravity of the sea is low from an admixture of fresh water, we have met with very many diatoms on the surface."

Taking maps which Mr. Buchanan has prepared, showing areas of low specific gravity and comparing these with the records of the occurrance of diatoms in great abundance, it is significent how often these agree. Again, excepting the area of the diatom ooze, those places where diatoms are abundant and where the specific gravity of the water is low, coincide generally with the areas where the blue muds are found; *i. e.* along the continents and great islands. It may be stated generally that close to these shores we have in the surface waters organisms more or less distinct from those occuring in the open sea. Besides many forms of diatoms, the true *Noctiluca* several *Peridinia*, larva of Annelids and Mollusca, Thyproid Medusæ, are more or less characteristic of these shore waters. In the Antarctic, in the Arapora Sea at Hong Kong, of Japan, and elsewhere the ton-nets were frequently filled with a yellow slime in a short time, which consists chiefly of diatoms. In the Southern ocean, as has been stated, the diatoms forms a peculiar deposit. In other deposits they are at times also well preserved, but occasionally are either completely marked by shore debris or removed from the bottom. In the open ocean, in the region marked by the north edge of the N. E. trade-wind and south of S. E. trade, small forms of diatoms do not occur in any numbers. They are represented, however, by those large species, which are indescribed so far as is known. Mr. Wild has figured two of these in plate 21. These organisms have an exceeding thin coat of silica and are true diatoms, though they have been compounded with *Noctiluca*. The cuculci of both these forms are highly phosphorescent, and to them diffused phosphorescence of the ocean within the tropics is generally due. A third large diatom has a cylindrical shape and a thicker coat of silica and is phosphorescent. These three forms are highly characteristic of the presence of tropical oceanic waters. The provisional name of *Porocystis* is proposed for the organisms figured in this plate.

In the plate 21, is a disc called *Pyrocystis pseudonoctiluca* (Wy. T.), which is magnified x 150, and the "nat. size" of 0.5 mm. The size is about three inches across. It is a disc with the contents in it. They are not shown as in motion, but there are several large cells which, I am convinced, are over and like "oil globules." It is the same as Castracanes called *Ethmodiscus gigas* (Voyage of the "Challenger"—Botany, Vol. II, page 169; Plate XIV, page 6). The name *Pyrocystis pseudonoctiluca*, Wy. T., must stand, as the publication is dated 1876—ten years before Castracanes.

Dr. Murray figures another *Pyrocystis fusiformis*, Wy. T. x 36; nat. size, 1 mm. This cannot be a *Pyrocystis*, as it is not a disc but like a *Navicula*. I cannot place this at all. It is not like any bacillaria I know of. He also mentions (page 533): "A third large diatom has a cylindrical shape and a much thicker coat of silica, and is not phosphorescent." Perhaps this is a *Melosira*.

But what I want to draw the attention to is the phosphorescence of the bacillaria (diatoms) which are common in the ocean. I do not think this has been recorded as yet. In fact, the life of the sea in the tropics, as well as in our regions, for the matter of that, is yet to be recorded. Bacillaria are plenty in the tropics. I have myself seen them at San Francisco, California (which is semi-tropic), existing in abundance, and even there they have not been recorded at all. I hope soon again to visit California, and will then skim the sea and get some wonders that will surely repay any time spent.

THE RED BLOOD CORPUSCLE IN LEGAL MEDICINE.

The above important subject was carefully considered in a paper read before the 1896 meeting of the American Microscopical Society, by Professor Moses C. White, M. D., of Yale University. The columns of the BULLETIN will not permit the reprinting of more than the concluding paragraphs of this valuable treatise which may be found printed in full with illustrations, in the *Transactions of the American Microscopical Society*. Professor White after mentioning the fact that the

value of microscopical examination of the blood stains in medico-legal cases had been denied by some microscopists, considers the objections offered by them, suggests methods of overcoming these objections and concludes as follows:

"From this discussion we claim that it has been proven beyond any reasonable question:

1. That in favorable cases blood stains can be so treated that reliable measurements and credible diagnosis of their origin can be given, as shown in the tables given and in others which might be referred to.

2. That if error occurs on account of imperfect restoration of the form and diameter of the corpuscles obtained from a stain proved [by (*a*) the Guaiacum test, (*b*) the spectroscope, (*c*) by the production of hemin crystals] to be blood, the error, if any, will be to make human blood appear like that of one of the inferior animals, and never to mistake the blood of the ox, pig, horse, sheep or goat for human blood.

3. In general, when a stain has been proved to be blood by the above tests, it may be decided certainly whether it is or is not mammalian blood. So, also, a stain from the blood of the ox, pig, horse, sheep and goat may be distinguished from human blood: thus confirming the claim of an accused person in many cases that his clothes are *not* stained with human blood. This negative testimony is certainly quite as important in many cases as testimony inculpating a prisoner.

Lastly, the expert can say, when the average of a suitable number of corpuscles from a blood stain corresponds with the average of fresh human corpuscles, that the stain is certainly not from the blood of the ox, pig, sheep or goat; and in other cases he can say, with great certainty, that a given stain is not human blood.

Such testimony, by a skilled microscopist, is of untold importance in saving the lives of the innocent, and often in overthrowing the plea of those who are guilty. Such testimony is quite as reliable and important to the welfare of society as that of the chemist who testifies to the presence or absense of poison that might have some resemblance to the many recently discovered ptomaines."

DEMONSTRATION OF KARYOKINETIC FIGURES.

In reply to a query from a correspondent, who asks if there is not some method of technique for the demonstration of karyokinetic figures, less complicated than that given in this journal some years ago, and usually given in works on microscopical technology, we would state that the following is the simplest process with which we are acquainted. It answers the purpose admirably:

Harden the vegetable in mass in absolute alcohol, or better, immerse the sections when cut in that medium, and leave for a period sufficient to fix them, longer or shorter according to the nature of the structure. Remove thence directly (without rinsing) into an aqueous solution of saffranin, and let remain there for five or six minutes. Thence remove to a fluid composed as follows: Dissolve 1 part of chromic acid in 1,000 parts of distilled water, and of this solution add 1 part to 9 parts of absolute alcohol. Let remain from 30 seconds to 1 minute, agitating the solution continuously; remove, rinse in alcohol of 98°, and thence plunge into absolute alcohol. They are now ready for clearing with oil of bergamot, and mounting in damar. This process stains the true nucleoles and chromatin threads a brilliant red, the nuclei in repose, a paler red, leaving the intercellular substance and protoplasm unstained. The differentiating solution may be varied to suit circumstances, but should never be stronger than one part of the aqueous solution of chromic acid to 8 parts of absolute alcohol. If made weaker than 1 to 10, the substance should remain longer in the solution, and we may add that in the majority of cases this is the better plan to follow. Prepare the mixture freshly every time that it is required for use, though the solution of chromic acid may be kept ready for mixture with the alcohol indefinitely.

Bergamot oil is far preferable to clove oil as a clearing agent in this class of work, since the latter acts on the anilin stains used in the various stages of karyokinesis, extracting the color, and acting more strongly in this direction on the nuclei in repose than on those in mitosis.—*National Druggist.*

A SIMPLE AND ACCURATE METHOD OF ESTIMATING THE PERCENTAGE OF HÆMAGLOBIN IN THE BLOOD.*

Dr. C. E. Ide describes Hammerschlag's Specific Gravity Method for the estimation of Hæmaglobin as follows:

The last method which I shall record, and which I wish to recommend, is that of Hammerschlag. No series of solutions which must be continually standardized is necessary, and the apparatus required is simple and

*Abstract from article in *Medicine* (June, 1897) entitled "Preliminary report on a simple and accurate method of estimating the percentage of hæmaglobin."

cheap and can be carried about by every physician. It is as follows: (1) a hydrometer jar; (2) a hydrometer (or urinometer); (3) a pipette of small caliber; (4) a glass rod; (5) some steel pens; (6) a bottle of chloroform; (7) a bottle of benzol; (8) a bottle containing a mixture of the latter two; and (9) some filter paper. The procedure is as follows: The mixture of chloroform and benzol (beginning at the first test with equal parts, for instance) is poured into the hydrometer jar, the finger-tip of the patient is sterilized with a solution of carbolic acid and pricked with one of the pens (from which one of the nibs has been broken), which has been sterilized in a flame. A drop of blood which has been allowed to ooze from the puncture (not squeezed out) is sucked into the pipette and then gently forced out into the centre of the mixture and shaken off. To avoid mixing air with the blood-drop all the blood is not to be forced out from the pipette, but a little left in its tip. If the blood-drop sinks the mixture must be made heavier with a little chloroform; if it rises benzol must be added. The mixture must be agitated after each addition of either fluid with the glass rod, to keep the chloroform and benzol well mixed, avoiding the breaking up of the blood-drop. When the drop remains stationary, twirling around but neither rising nor sinking, the specific gravity of the mixture corresponds with that of the blood and is taken with the hydrometer. The same mixture is used indefinitely, the blood being filtered out after each test. The hydrometer jar must be kept absolutely clean, that no fine particles of foreign matter may float in the mixture and adhere to the blood-drop.

The glycerol-water and chloroform-benzol methods give practically the same results, according to Siegel, and Hammerschlag states that there is little difference between the results obtained by using the chloroform-benzol mixture and the pycnometer; but it is readily seen that the former method is much the simplest, and dexterity is soon acquired.

The influence of room temperature makes no difference in the results, according to Roy, Jones and Hammerschlag.

Now having determined what is the specific gravity of the blood in health, and having devised a simple and accurate method of ascertaining the specific gravity of any specimen of blood, the problem is to construct a table giving the percentages of hæmaglobin which correspond with the determined specific gravity. In 1890 Hammerschlag constructed such a table after comparing the specific gravity with the percentage of hæmaglobin in a large number of cases. But in making his tests he used the instrument of Fleischl, which we have found to be more or less inaccurate. Now I propose to continue researches into this subject and construct, if possible, a table which will be more accurate than that of Hammerschlag. I write this preliminary report in the hope of inspiring others to work on the same lines, and will give the table of Hammerschlag, which is approximately accurate, for the benefit of those who in the meantime wish to make use of the specific gravity method, and those who cannot afford to purchase the more costly apparatus, which in reality is less accurate and less trustworthy. I would that I could prompt every physician in the land to possess this simple apparatus, carry it about with him, and employ it when indicated, instead of guessing at diagnoses.

The table of Hammerschlag which I have mentioned is as follows:

Specific gravity.	Hæmaglobin.
1.033-1.035	25-30 per cent.
1.035-1.038	30-35 per cent.
1.038-1.040	35-40 per cent.
1.040-1.045	40-45 per cent.
1.045-1.048	45-55 per cent.
1.048-1.050	55-65 per cent.
1.050-1.053	65-70 per cent.
1.053-1.055	70-75 per cent.
1.055-1.057	75-85 per cent.
1.057-1.060	85-95 per cent.

I have sometimes obtained a specific gravity of 1.065 and considered that it indicated 100 per cent. of hæmaglobin. According to Hammerschlag this table holds good for anemia, chlorosis, malignant tumors and tuberculosis. In interstitial nephritis the specific gravity is relatively lower than the percentage of hæmaglobin. In fever, again, it is relatively lower, rising after defervescence. In disturbances of the circulation, even when there is edema, the specific gravity is generally normal.

NOTES ON TECHNIQUE.

BY PIERRE A. FISH, D. Sc., CORNELL UNIVERSITY, ITHACA, N Y.

In many of the modern articles, the methods by which certain pathological structures are demonstrated, if mentioned at all, are frequently so meagre in the description of important details as to be practically useless to many workers, unless a certain amount of their time is devoted to experimentation. A person who has obtained fairly successful results with his older methods is loath to forsake them, especially if his first few attempts with the new are failures. Each investigator may have certain laboratory conveniences; reagents of the best quality and dyes that have been well tested, all of which will enable him to obtain results much superior to his less fortunate colleague. It is difficult, therefore, to work successfully unless details are carefully attended to, and the reasons for the various steps understood. The methods fol-

lowing have been well tested, and have been attended with uniformly good results, which, in some cases, it is believed, would have ended in failure with the older methods.

FIXATION.

The fixation of pathological tissues, with strong alcohol for histological study, is very commonly employed for the double purpose of killing at once any microörganism that may be present and at the same time to preserve the structure of the part. With many tissues this caused a too rapid withdrawal of the contained water or lymph, so that the specimen becomes hard and gives unsatisfactory results when it comes to the cutting process.

Some experiments with different reagents, upon known pathological material, were of service in formulating a mixture which obviated the defects of strong alcohol when used alone. This mixture, while quickly killing the bacteria, also preserves most faithfully the histological structure. Various solutions of formalin, including the undiluted, were employed, and gave good results, particularly the presentation of the bacteria, after the usual staining methods. The tissues were more or less swollen by the weaker solutions, in marked contrast to the contraction caused by alcohol. Various combinations of formalin with alcohol were also tried, and that which seemed to be most completely satisfactory for quick penetration and convenience, bacteriologically and histologically, was as follows :

95 per cent. alcohol	100 parts
Commercial formalin (40 per cent. formic aldehyde)	10 parts

Pieces of tissue, ½ centimeter square, are well fixed in from twelve to twenty-four hours, after which it is well to leave for a few hours in 95 per cent. alcohol before clarifying for the paraffin bath. Specimens, transferred directly from the fixing mixture, have been clarified in chloroform or cedar oil, but it requires a longer time.

The addition of the formalin is advantageous, because in a way it brings about a state of equilibrium. The alcohol alone shrinks the tissue, while on the other hand formalin swells it, so that in this respect the one reacts against the other.

ADHESION TO THE SLIDE.

After the infiltration and imbedding of the tissue in paraffin, the question of the treatment of the sections is one of some importance. If they are to be carried through a series of reagents in watch glasses, and not placed upon the slide until they are mounted, the sections must necessarily be rather thick, in order to withstand the manipulation. Very much thinner sections, if adherent to the slide, and consequently supported by it, can be carried through the different steps of the process without injury, and show the structural elements to much better advantage.

The albumen or collodion adhesive, usually employed for this purpose, however, possesses the disadvantage of taking the aniline colors used in bacteriology, sufficiently to disfigure the preparations. If a clean slide be coated with a thin film of glycerine and then rubbed very nearly dry with a cloth or the hand, and a drop or two of 35 per cent. alcohol be placed upon it, the section, if curled, will tend to flatten itself when placed on the alcohol. If the slide now be placed in a thermostat for a few hours, at a temperature near the melting point of paraffin, the heat will cause any wrinkles or irregularities of the section to disappear ; the alcohol slowly evaporates and when the slide is thoroughly dry the albumen molecules of the tissue adhere quite firmly to the slide, as noted by Gaule. After this the slide may be heated gently over a flame until the paraffin begins to melt. If any moisture remains the section will be quite likely to loosen during the latter stages. Thick sections do not adhere so firmly as thin ones. The slides may then be immersed in a jar of turpentine or any solvent of paraffin and carried through the various grades of alcohol to water.

A shorter method, in which there is as firm adhesion of the section to the slide, is to bring the slide in contact with aniline oil for a few minutes after the treatment with the turpentine, absorbing the superfluous turpentine with filter paper. The aniline oil is also removed by means of filter paper. The section is then thoroughly washed in distilled water which removes the oil, and the tissue is then stained and washed in water. If aniline stains are used, a hurried rinsing is sufficient. Drain or absorb the water and again apply the aniline oil. Besides clearing the section the oil tends to remove the aniline stain and care must be exercised in not letting this process go too far. Displace the aniline oil with xylol and mount in balsam. The color ought not to fade if the aniline oil has been thoroughly removed.

With certain stains, or combinations of them, the aniline oil may not succeed in preserving the sharp definition of the color. Under such conditions the sections, after staining, may be treated directly with absolute alcohol to dehydrate and remove any superfluous stain. Some aniline dyes are not as soluble in absolute alcohol as in the weaker grades. Clear in xylol and mount in balsam.

The use of aniline oil in the treatment of the sections will be recognized as having been recommended by Weigert for bacterial purposes. It likewise gives most excellent results in ordinary histological work and is a saving of time and material.

MOUNTING.

Many valuable specimens are ruined for the want of sufficient precaution in the preparation of the balsam. In its commercial state it contains many volatile principles and traces of acids, which, in the course of time, act upon the specimen and diminish or entirely remove the color. All this may be lessened, if the balsam be heated sufficiently to drive off the volatile constituents, or more thoroughly obviated if a little potassium carbonate or mild alkali be added to neutralize the acid just before the balsam is heated. When the balsam becomes hard it can be broken into flakes and stored. When wanted for use dissolve in xylol to the desired consistency and filter through absorbent cotton. Specimens stained with the Biondi-Ehrlich mixture (which fades so easily) have at the end of a year shown no signs of losing their pristine clearness.—*Read before the American Microscopical Society, August, 1896 and reprinted from Transactions of A. M. S. issued March 1897.*

METHOD OF SPLITTING SELENITE PLATES.

After securing a good flat piece of selenite of the required size, say ¾ inch square, and splitting it with a thin blade down to say $\frac{1}{50}$ inch in thickness, which is comparatively easy to do, cement one side of the plate to a glass slip, using any convenient cement. Ordinary glue will answer, or even mucilage—anything in fact that will hold the plate firmly. Then, using the same thin blade, carefully detach layers of the plate, one after another, until you get the plate attached to the glass nearly thin enough, making sure each time, that you remove all of each stratum.

Now put the slip in some liquid (warm water answers for most cements), and let remain until the selenite plate is detached. Handle very carefully, and cement to another slip the face that was uppermost in your first operation. Let dry, and proceed as before, testing occasionally with the Nicol prisms and some crystalline object to see if you have got the selenite down to a proper thickness or thinness. In our experience the thinner and sharper the blade, the easier the operation.—*National Druggist.*

DEEP SEA SOUNDINGS FROM THE PACIFIC OCEAN.

BY PROF. ARTHUR M. EDWARDS, M. D.

NEWARK, N. J.

I have some of the deepest soundings from the ocean bottom that have ever been made, and I think it will be well to now make known the microscopic examination. The specimens were received from the kindness of Captain Wharton, H. B. M., Hydrographer at the Admiralty, London. They were soundings made by Captain Pelham Aldrich, and Commander C. F. Oldham, in H. M. ship "Egeria," and Captain A. F. Balfour, of H. M. ship "Penquin," and I transcribe from the "blue book" of the Hydrographer which Captain Wharton has sent me the following:

"For some years it has become evident that the time has come when, in the general interest of navigation, a systematic examination of the bed of the Pacific ocean, between New Zealand and the Sandwich Islands, should be undertaken in order to verify or disprove the many doubtful dangers reported, to fix the positions of islands and to survey such groups as lie on the track between the great British possessions of Canada and Australia." This was the duty assigned to these gentlemen. They examined the sea bottom to see just how it lay and incidentally they brought specimens of the sea bottom home to be seen by searchers after "little things." In this way there came into my hands, the soundings I have to mention.

Captain Balfour in the "Penquin," had the good luck to make certain soundings which are designated thus: They were the deepest soundings ever hitherto made, 500 fathoms, or half a mile deeper than the soundings of U. S. S. "Tuscarora," in 1875, in the northeast of Japan, where 4,655 fathoms were obtained. When examined by means of the microscope the "Penquin" soundings were seen to be composed of sand, siliceous most likely, and volcanic pumice, polycystina, sponge spicules and sparingly shells of bacillaria, (diatoms). The commonest was *Fragilaria antartica, Cast.* This was found by Castracane, "in mud obtained from a sounding in the neighborhood of Japan." They are also in the sounding brought back by the "Tuscarora." In the Antarctic as well as the Arctic oceans it seems to be a common form, both in the oceans and on the shores, for I have found it in the sunken coast period days of our North American findings, and it is scarce living still in the water that is left on the meadows of Newark, New Jersey. It seems to be derived from *Scaptroneis caduceus*, C. G. E., which is so common in the fossil marine miocene of Virginia and New Jersey.

PUBLICATIONS RECEIVED.

Auto-Intoxication, reprinted from *University Medical Magazine*, by Samuel Wolfe, A. M., M. D.

The Foraminifera of the Marine Clays of Maine. Reprinted from "Proceedings of the Portland Society of Natural History." By Frank S. Morton.

The San José Scale in Illinois. By Professor S. A. Forbes, Ph. D. The above is issued in form of a bulletin, by the Experiment Station of the University of Illinois. Professor Forbes describes this most injurious form of scale insect and suggests precautions to prevent the further spread of the pest. The full report will doubtless be sent to anyone interested, who may write to the Experiment Station or to Professor Forbes.

Broom-Corn Smut. By G. P. Clinton, M. S. This is also a bulletin issued by the Agricultural Experiment Station of the University of Illinois, and includes practical instruction as to the prevention of the disease.

[From Transactions of American Microscopical Society.]

PHOTOMICROGRAPH vs. MICROPHOTOGRAPH.

(*Second Note.*)

BY A. CLIFFORD MERCER, M. D., F. R. M. S.,
SYRACUSE, N. Y.

In addition to the first note under the above heading, published in the "Proceedings of 1886," page 131, I would like to add: The word Photomicrograph was first used In 1858. An account of its origin can be found in the *Liverpool and Manchester Photographic Journal* (now *British Journal of Photography*), August 15, 1858, at page 203, and in the same volume at page 414, and also in *Sutton's Photographic Notes*, Vol. III, at pages 205a nd 208. In the latter, at page 205, J. T. Taylor writes: "By the way, Mr. Shadbolt (who is an authority on microscopy), or anyone else, kindly suggest a suitable name for such magnified pictures? 'Microphotograph' won't do, because the name has been given to reduced pictures." At page 208 George Shadbolt answers: "The word microphotograph originated, I believe, with myself, and is applied, I think correctly, to very *small photographs*, not to photographs of *small objects*, which would more correctly be photomicrographs; but probably a convenient word for this class of subjects, as well as enlarged subjects generally, would be megaphotographs."

HINTS ON BACTERIOLOGICAL TECHNIQUE.

Dr. Czaplewski, in *Centralb. für Bakteriol. und Parasitenk*, gives a few practical hints on certain points often occuring in bacteriological work. Pipettes for obtaining samples of pus or other juices free from contamination with blood, fæces, etc., are often required. They may be made out of a piece of glass tubing a little longer than the ordinary test-tube, and from 3 to 4 mm. thick. One end is drawn out to a fine open point and then stopped with cotton-wool. The pipette wrapped round with cotton-wool is placed in a test-tube, and then dry or steam sterilised.

Pieces of tissue should first be washed with water and then with 1 : 1000 sublimate for about one minute, after which they are plunged in spirit for about half a minute. The alcohol is then burnt off so that superficial impurities are removed and the internal portions opened up by tearing or cutting for examination.

Knives and syringes are freed from contamination by immersing them in caustic potash solution to soften the albuminous matters. These are then wiped off, the instrument dipped in spirit and the spirit burnt off. Gelatin should be boiled in a porcelain lined vessel, and this placed inside another saucepan filled with water, care being taken to prevent the gelatin pan from wobbling.

Before inoculating birds, their feathers should be wetted with spirit dabbed on with cotton-wool.

Infectious material and apparatus used in bacteriological work should be disinfected by boiling them for a good hour in a closed vessel, say a Papin's digester, about half filled with water. This procedure is more trustworthy that the use of chemicals.

Platinum loops should be of a definite size or sizes. These can be made by winding thin platinum wire round "standard" (½–5 mm.) wires of definite thickness. In this way, not only is the loop circular, but holds a definite quantity.

For inoculating eggs, the egg-borer used for blowing birds' eggs is very convenient. To obtain samples of blood for bacteriological examination, the skin should first be wiped over with strong caustic potash solution, and then washed with spirit. After this it is further disinfected with sublimate, followed by alcohol and ether; after the evaporation of the latter the skin may be pricked.

For imbedding small pieces for sectioning on a freezing microtome, cacao-butter is convenient as its setting point is 20°, while it is quite fluid at 37°. After removing the piece from alcohol it is placed in a mixture of cacao-butter and chloroform, which contains so much of the latter that it is fluid at room temperature. In this it remains for 1–24 hours, according to the size of the piece; it is then transferred to liquefied cacao-butter (37°), and after a few to 24 hours sectioned. The cacao-butter is removed with turpentine, after which the sections are placed in alcohol. —*Jour. Roy. Mic. Soc.*

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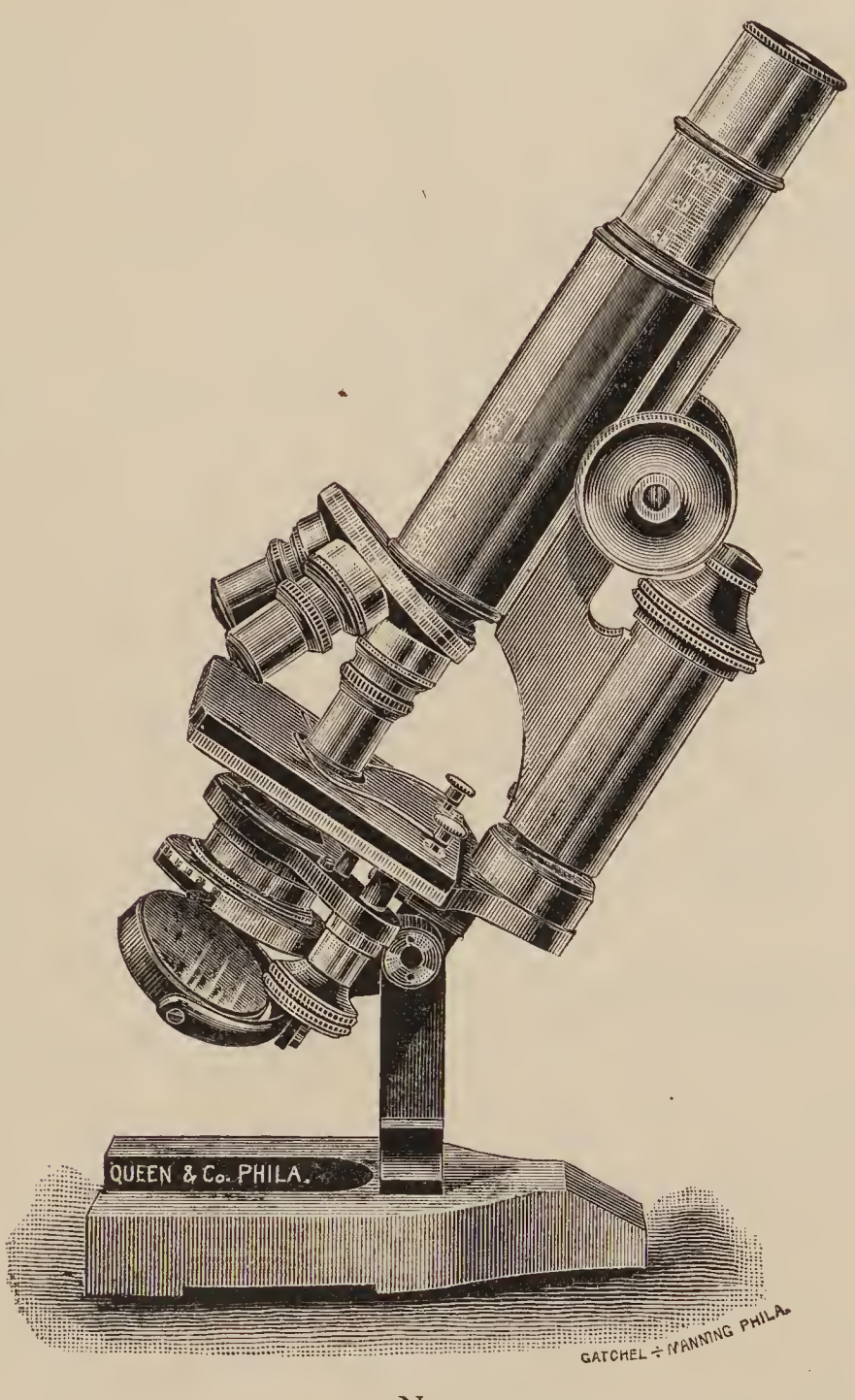

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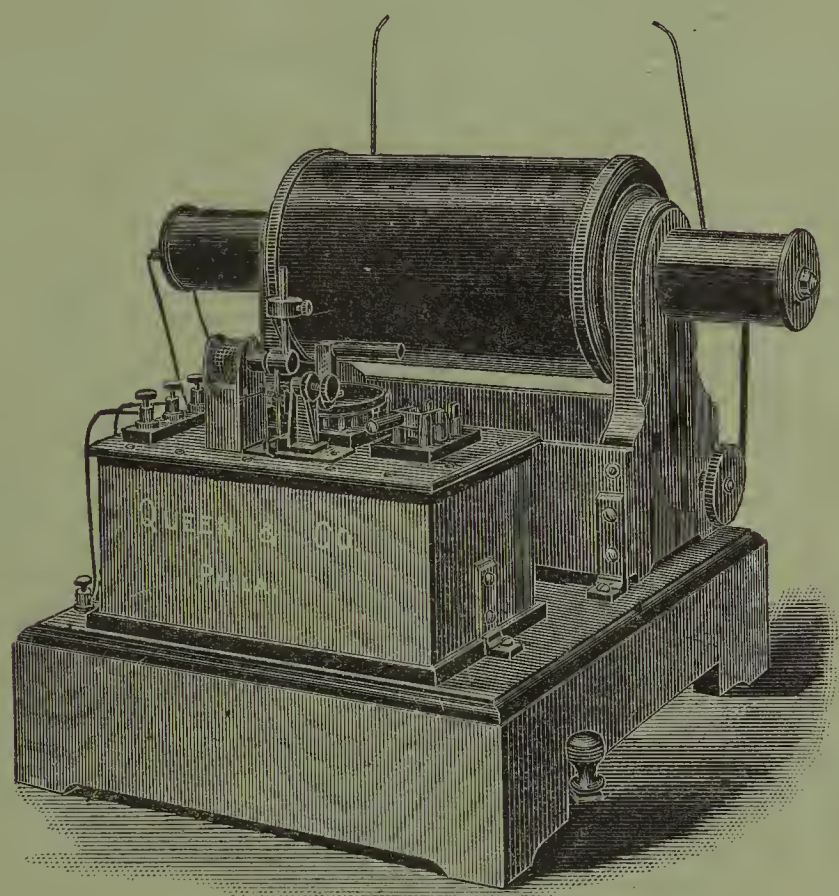

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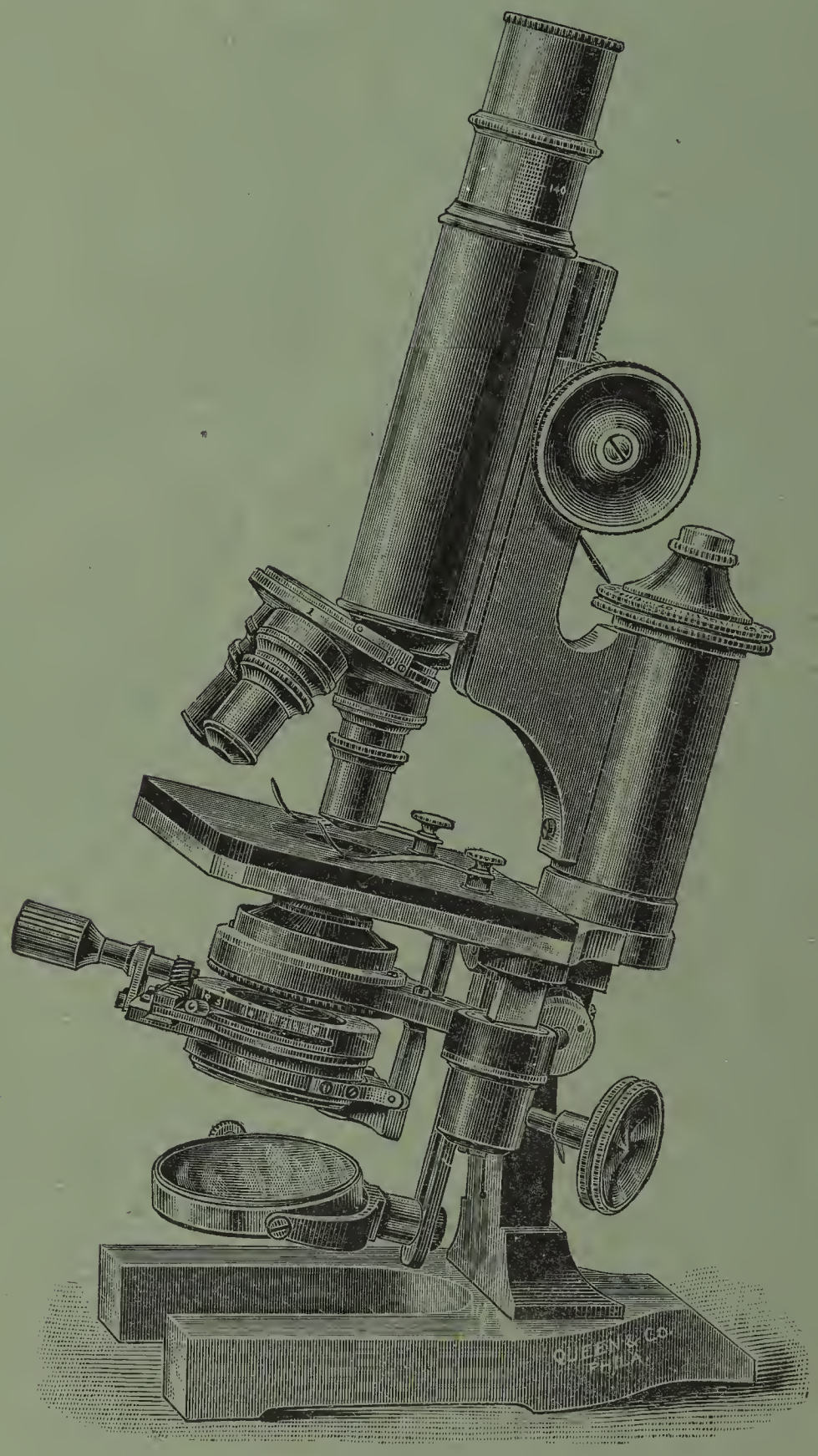

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